Improving the Reliability of Microarrays for Toxicology Research: A Collaborative Approach

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Microarray-based gene expression profiling is a critical tool to identify molecular biomarkers of specific chemical stressors. Although current microarray technologies have progressed from their infancy, biological and technical repeatability and reliability are often still limiting factors in many experiments. Researchers at Sandia National Laboratories have developed advanced measurement scientific techniques for improving microarray data generation and analysis. Researchers at the U.S. EPA (Ecological Exposure Research Division/NERL) have joined in collaboration with Sandia National Laboratories to apply these novel methods to DNA microarrays from the wild aquatic species, *Pimephales promelas* (fathead minnow). These unique capabilities include hyperspectral imaging technology to assess quality control of array manufacture, statistically robust array designs to permit the highest confidence in the resulting data, and multivariate data analysis and visualization tools to better facilitate data mining and biomarker identification. When successful, this integrated approach to improving microarray platform will permit extraction of the highest-quality data from a minimal set of experiments, thus facilitating a more accurate and sensitive determination of specific molecular diagnostic indicators to monitor bioavailable stressors in aquatic ecosystems. This monitoring effort is critical to the U.S. EPA's exposure characterization as part of its ecological risk assessment mission.

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